UNM SCHOOL of ENGINEERING
Department of Electrical & Computer Engineering

ECE 344L Knowledge Probe Solution

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What is the minimum number of bits that is needed to represent the unsigned decimal value of 12,375?

Some key relationships:

1 bit – 2 values, 0 and 1

4 bits – 16 values, 0..15

10 bits – 1,024 values 0..1023

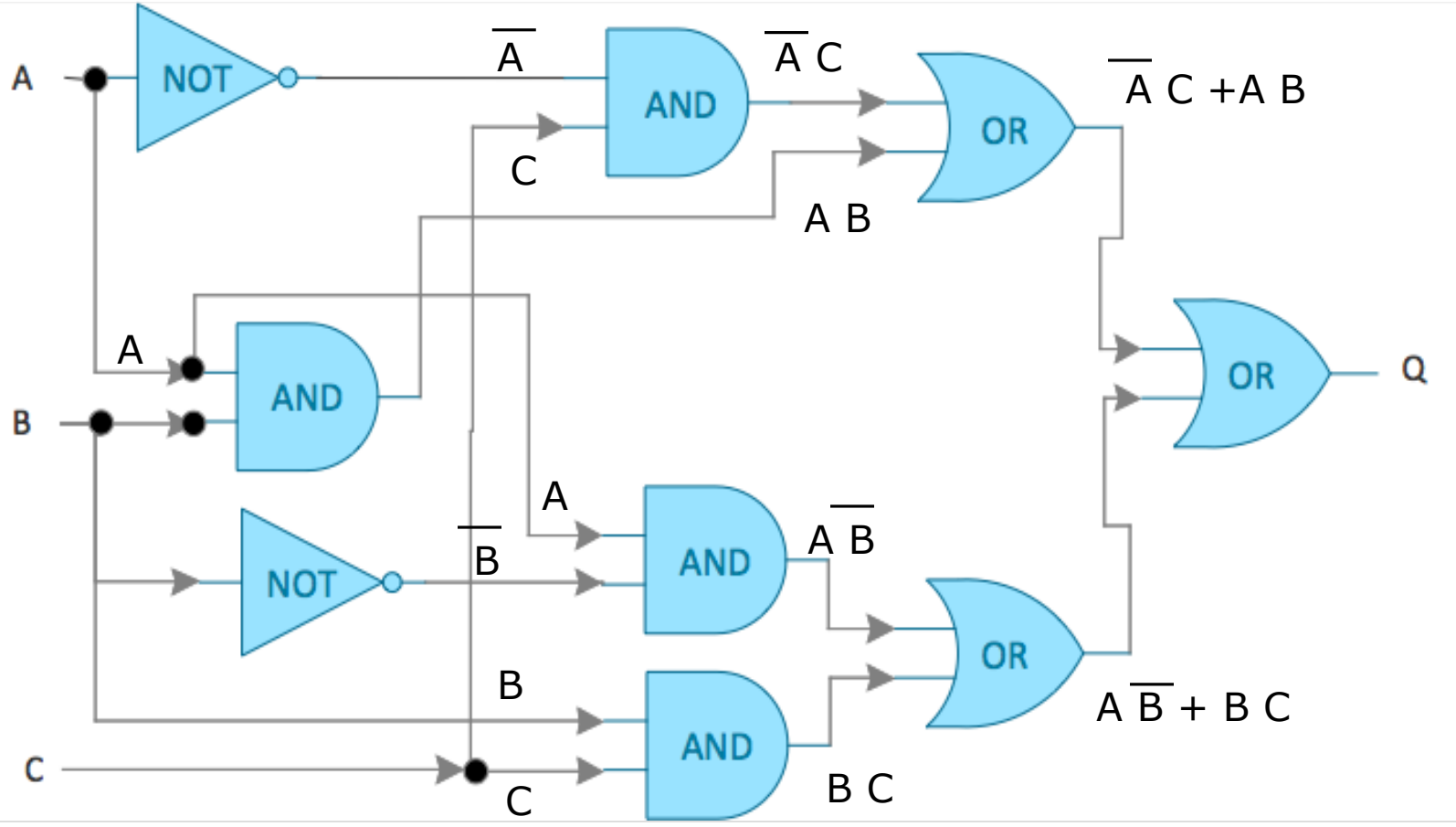
12 bits – 4,096 values 0..4096

14 bits – 16,384 values 0..16383 ← we need at least 14 bits

Fill in the following table showing the equivalent representation of the binary number 01010110.

One's complement:	10101001
Add 1	00000001
Two's complement:	10101010
Decimal Equivalent:	
01010110	64+16+4+2 = 86
Hexadecimal:	0101 0110
0 x	5 6

Boolean Function



Boolean Function & Truth Table

Complete Boolean Function:

$$Q = \overline{A}\,C + A\,B + A\,\overline{B} + B\,C$$

A	B	C	Q	
0	0	0	0	
0	0	1	1	¬A C
0	1	0	0	
0	1	1	1	¬A C, B C
1	0	0	1	A¬B
1	0	1	1	A¬B
1	1	0	1	A B
1	1	1	1	A B, B C

Boolean Reduction

AB \ C	0	1
00	0	1
01	0	1
11	1	1
10	1	1

Reduced Function: $Q = A + C$

Combinational & Sequential Circuits

A

Figure A – Functional equivalent to a combinational circuit as the output is only a function of the current input values.

B

Figure B – Functional equivalent of a sequential circuit as the output is a function of both the current and previous inputs.